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RESEARCH ARTICLE

Systematics of the Neotropical genus *Loxozus* (Diptera: Neriidae), with notes on distribution and sexual dimorphism

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ABSTRACT. The monotypic genus *Loxozus* Enderlein, 1922 is redescribed. After examining the holotypes of *Tetanocera cornuta* Walker, 1853 and *Loxozus clavicornis* Enderlein, 1922, we confirm that these species are synonyms and reiterate that the correct name of the nominal species is *Loxozus cornutus* (Walker, 1853). The male of *L. cornutus* is described for the first time and notes on the species' sexual dimorphism and illustrations of the genitalia are provided, together with distribution data, including new records for Venezuela, Brazil and Peru.

KEY WORDS. Monotypic, Neotropical, Nerioidea, new records, taxonomy.

INTRODUCTION

The monospecific genus *Loxozus* Enderlein, 1922 was described from one female, *L. clavicornis* Enderlein, 1922, collected in the Colombian highlands (Fig. 1). *Loxozus* differ from other Neotropical species of Neriidae in the very oblique vein dm-cu and the thin and elongate scape and pedicel (Aczél 1961). Steyskal (1965) synonymized *L. clavicornis* under *Tetanocera cornuta* Walker, 1853 (Fig. 2), a species originally described in Sciomyzidae from a female specimen also collected in Colombia. But, in a subsequent catalogue, Steyskal (1968) recorded *L. clavicornis* from Bolivia, apparently disregarding that a few years before (Steyskal 1965), he had synonymized it with *T. cornuta*. Since the publication of the Steyskal's (1968) catalog, in which *L. clavicornis* was erroneously included as valid species name, the synonymy with *T. cornuta* has been overlooked (Mello and Ziegler 2012, Sepúlveda and de Carvalho 2016).

Original descriptions of the two female holotypes, *T. cornuta* and *L. clavicornis* (Figs 1, 2), contain the only published morphological information available for the species. The only known records of the species correspond to the Colombian holotypes and several female specimens from Bolivia examined by Steyskal (1968). Here, we provide information on new material of *L. cornutus*, including males from different localities in South America, images of the type material and a description of male genitalia, including the first description of the phallus.

MATERIAL AND METHODS

Specimens from the following institutions were examined for this study (abbreviations according to Evenhuis 2017): MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; NHMUK, The Natural History Museum, London, United Kingdom; USNM, National Museum of Natural History, Smithsonian Institution, Washington D.C., United States of America; ZMHB, Museum für Naturkunde der Humboldt-Universität, Berlin, Germany.

The female holotypes were studied and after confirming the cospecificity with other no-type material, a redescription of the species is provided including variations among females, while variable male traits are described separately. Total length was measured from the anterior margin of the parafacial to the posterior margin of tergite 6 (excluding antenna and terminalia). Examined specimens are identified by a number, which we also included in the determination label and cited here in the material examined section in brackets, along with the acronym of the depository institution. Known distribution is indicated by country, where asterisk (*) indicates new records. Terminology used in the description of male terminalia follows Sinclair (2000).

Figures 1–2. Type material: (1) *Loxozus clavicornis*, female holotype, photo by courtesy of Joachim Ziegler, ZMHB; (2) *Tetanocera cornuta*, female holotype, photos by courtesy of Daniel Whitmore, NHMUK.

TAXONOMY

Loxozus Enderlein, 1922

Loxozus Enderlein, 1922: 156. Type species: *Loxozus clavicornis* Enderlein, 1922 (original designation) = *Tetanocera cornuta* Walker, 1853.

Diagnosis. Head rounded. Arista micropilose. Antennae separated by more than twice the width of scape at base. Antennal base blackish-brown and shiny; inner margin projected anteriorly over dorsal portion of face. Anterior margin of frons concave, projected anteriorly between antennal bases and beyond level of anterior margin of parafacial; frontal vitta with U-shaped yellow stripe separating it from the fronto-orbital plate. Face exposed in dorsal view between antennal bases. Vibrissa spine-like, inserted on small tubercle. Prosternum wide, joining proepisternal plate laterally. Postpronotal carina large, higher than postpronotal lobe. Mid coxa with three lateral setae.

Loxozus cornutus (Walker, 1853)

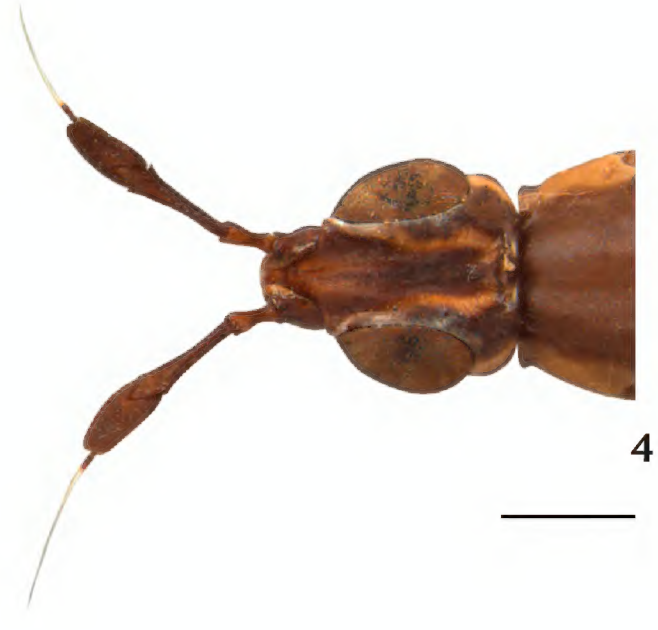
Tetanocera cornuta Walker, 1853: 401.
Loxozus cornutus; Steyskal, 1965: 446.
Loxozus clavicornis Enderlein, 1922: 156; Synonymy by Steyskal, 1965: 446.

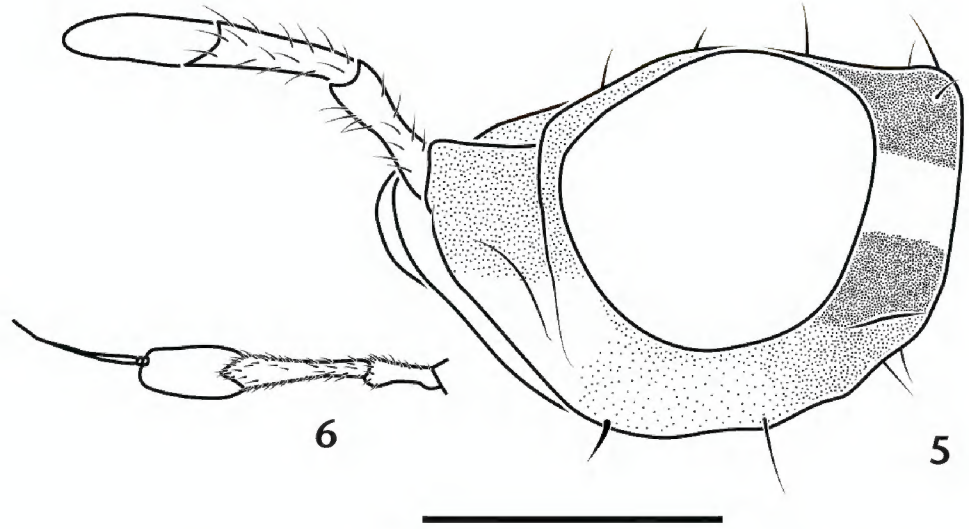
Type Material. Holotype, *Tetanocera cornuta*, female; Type locality: Colombia. LABELS: (1) South America, Colombia (2) Type (3) *Tetanocera cornuta* Walker [NHMUK] (Fig. 2).

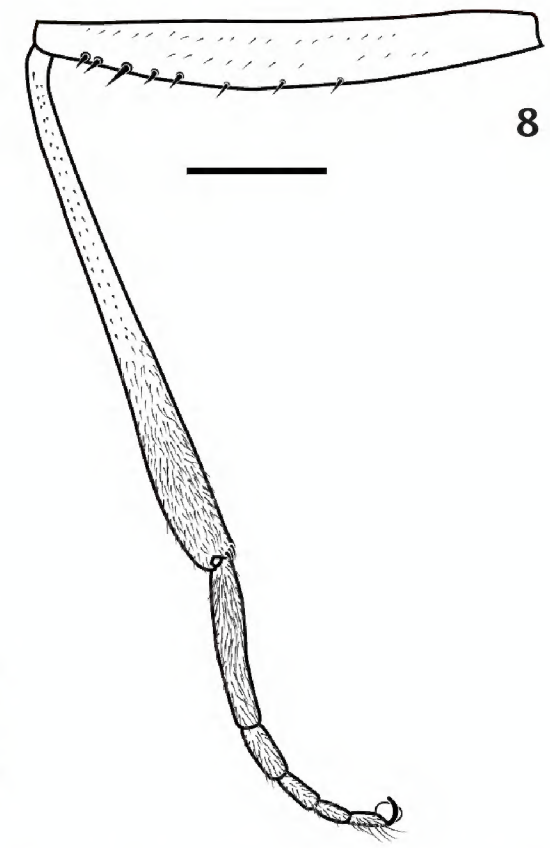
Holotype, *Loxozus clavicornis* female; Type locality: Colombia. LABELS: Cordillieren von Columbien, terra templada, Gesammelt von Professor Dr. Thieme [ZMHB] (Fig. 1).

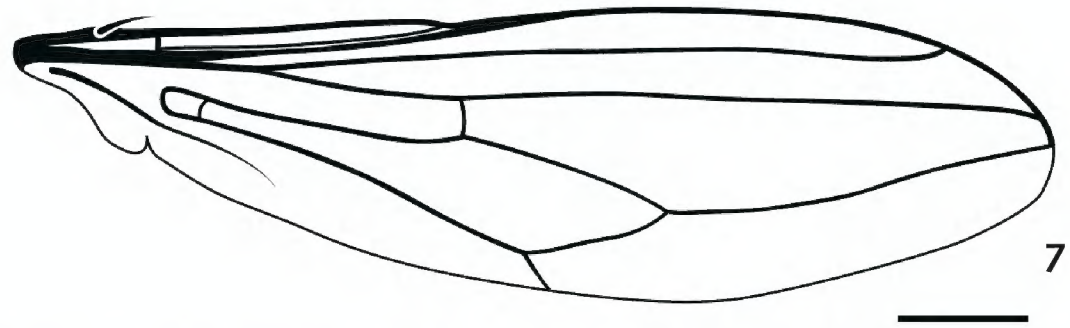
Female (Fig. 3). Body length 5.6–8.2 mm. Wing length 7.0–8.2 mm and width 1.9–2.2 mm; yellowish-brown with head and thorax partially yellow. One female from Venezuela is slightly paler and the Amazon specimen is the darkest.

Head. Antenna elongate, about same length as head (Fig. 4). Scape slightly constricted on basal half, length twice maximum









Figures 3–8. *Loxozus clavicornis*, female holotype: (3) habitus lateral; (4) head dorsal, (5) head lateral; (6) antenna, inner view; (7) wing; (8) fore leg, lateral. Scale bars: 1 mm.

width (Fig. 5). Pedicel narrowed, length more than three times maximum width and slightly less than twice length of scape; inner process of pedicel wide triangular (Fig. 6). First flagellomere brown with whitish micropubescence; dorsal and ventral margins parallel and apex widely rounded. Arista white, inserted dorso-apically on first flagellomere. Antennal bases conspicuously protrudent and separated medially by upper face. Frontogenal suture joins distal margin of antennal base. Fronto-orbital plate brown with white pruinescence; three short equidistant fronto-orbital setae, two anterior hair-like. Inner vertical seta almost hair-like. Ocellar triangle shiny and small. Parafacial brown and narrow (Fig. 5). Gena sub-shiny yellow and wide; genal seta spine-like. Postgena densely white pruinose with several black and white setulae. Occiput shiny brown, with wide yellow median stripe.

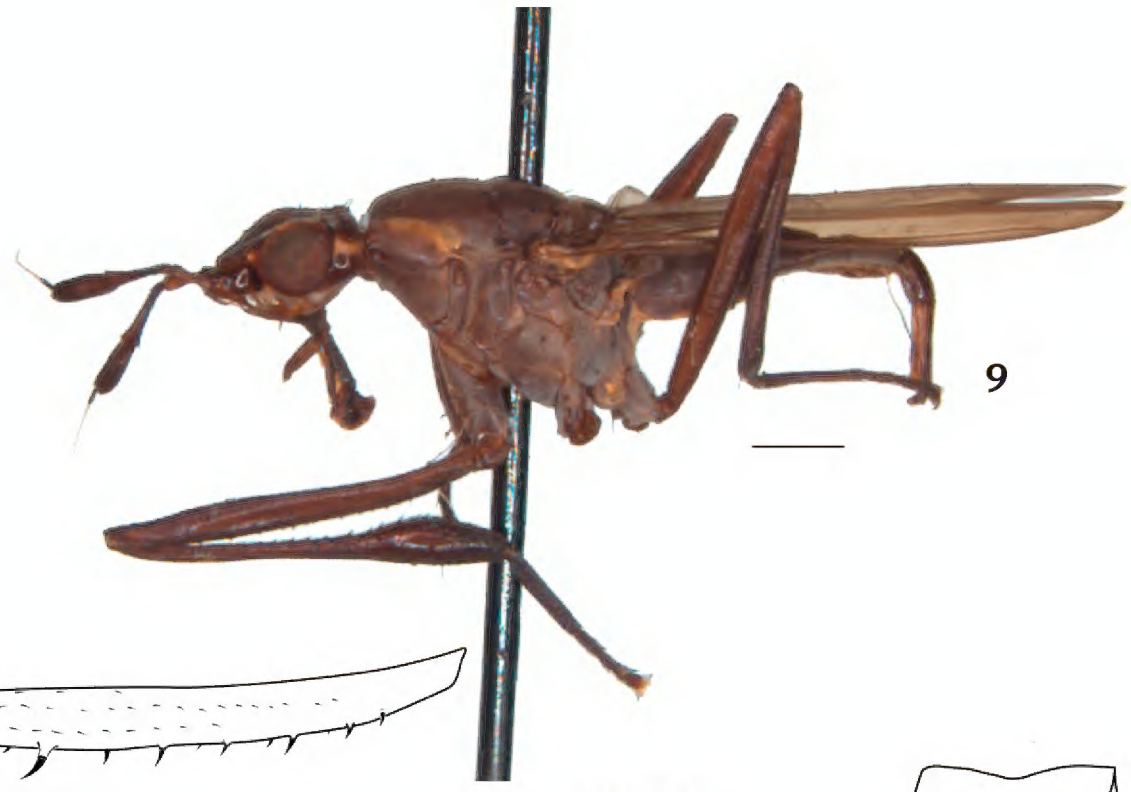
Thorax. Yellowish-brown pruinose with two dorsal white stripes, separated by a wide median brown stripe; pleura pruinose. Presutural scutum longer than postsutural scutum. One dorsocentral seta. Scutellum yellowish-brown pruinose with wide median yellow stripe; apical setae thick, slightly shorter than dorsal length of scutellum. Postpronotal lobe bare and yellow dorsally. Anterior notopleural seta absent, posterior notopleural seta spine-like, inserted on tubercle. Katepisternum with one short dorsal seta. Vein dm-cu very oblique (Fig. 7). Basicosta with one seta. Halter yellow, with black and orbicular knob. Coxae yellowish-brown; fore coxa with two antero-apical setae and two anterolateral setae; mid coxa with three lateral setae; hind coxa with one lateral seta. Femora brownish-yellow; fore femur with several anteroventral and posteroventral spine-

like setae on distal third; mid femur with two median setae on anterior margin and anteroventral and posteroventral spine-like setae on distal third; hind femur with two dorsal distomedian setae and anteroventral and posteroventral setae on distal third. Tibiae brownish-yellow with dark apex (Fig. 3) and slightly wider distally (Fig. 8). Basitarsomere short, less than 1/4 length of tibia.

Abdomen. Dark yellowish-brown with black setulae and lateral margins slightly paler. Oviscape dark yellowish-brown, darker medially and at apex.

Male (Fig. 9). Body length 9.1–10.4 mm; larger males with darker tegument. Wing length 6.7–8.0 mm and width 1.8–2.3 mm. Three fronto-orbital spine-like setae. Inner vertical seta spine-like. Parafacial with yellow medial stripe. Gena brown and shiny; genal seta not inserted in tubercle. Femora brown; fore femur with anteroventral spine-like setae inserted on digitiform tubercles and posteroventral spine-like setae short. Fore tibia brown; distal third conspicuously swollen with thick apical spine-like setae (Fig. 10); two lines of outstanding spine-like setae posteriorly (Fig. 11). Each tarsomere with dense and thick setae posteriorly and near apex; fifth tarsomere ovate, narrow proximally.

Terminalia. Epandrium yellowish-brown and cylindrical; slightly longer than syntergosternite 8; cercus wide linear with wide round apex and yellow thin setae; surstylus wide linear with wide rounded apex and sparse yellow thin setae at apex and almost as long as cercus, but narrower; distiphallus linear and partially sclerotized, distally bifurcated in one membranous short spike and one long membranous flexible tube (Fig. 12).



Figures 9–12. *Loxozus cornutus*, male: (9) habitus lateral; (10) fore leg, lateral; (11) fore tibia, posterior; (12) genitalia, ventral. Scale bars: 1 mm.

Material examined. Venezuela. 1 female, 30.i.1967- E. Miranda, Qda. Quintero- Caracas, col. J. M. A. Ayala L. [USNM, 2014]. BRAZIL. 1 female, RO. Monte Negro, Fazenda Amorin, 248m, S 10°40'6" W 63°29'0", Sweeping, 03-15.xii.2011, Amorin, Ament & Riccardi col. SISBIOTA, CNPq-FAPESP [MZUSP, 2013]. PERU. 1 male, Previsto, 800 m, 17.vi.1965, J. Shunke. B. M. 1965-529 [NHMUK, 2012]; 1 female, (1) Madre de Dios: Manu, Erika (near Salvación), 550, 5-6, sept.1988, A. Freidberg (2) *Loxozus clavicornis* Det. M. Buck, 2002 [USNM, 2018]. BOLIVIA. 2 females, (1) Rurrenabaque, Beni Bolivia, WMMann (2) oct (3) Mulford, BioExpl, 1921-22 [USNM, 2015, 2016]; 1 male and 1 female, (1) Rurrenabaque, BeniBolivia, WMMann (2) oct (3) Mulford, BioExpl, 1921-22 (4) *Loxozus clavicornis* End. Det. G. Steyskal, 1953 [USNM, 2017, 2026].

Distribution. Colombia, Venezuela*, Brazil*, Peru*, Bolivia (Fig. 13).

Remarks. After examining the holotypes of *T. cornuta* and *L. clavicornis*, we confirm the synonymy of these species and reiterate that the correct name of the species is *Loxozus cornutus*.

The only phylogenetic study of Neriidae (Koch et al. 2015), recognized two main Neotropical lineages in the family: the *Eoneria*-group and the *Nerius*-group. Although *L. cornutus* was not included in that study, according to the synapomorphies proposed for each of those two lineages, we hypothesize that *L. cornutus* is closely related to other species of the *Nerius*-group (i.e. strong increase in female size; presutural scutum longer than postsutural scutum; several changes in wing venation; polished and shiny antennal base; reduction in setae length; lack of occipital setae; and reduction in the number of setae on both basicosta and male fore coxae). Within *Nerius*-group, *Loxozus*, seems to be morphologically related to *Nerius* Fabricius, 1805 by the peculiarly wide inner process of pedicel and prosternum. *Loxozus cornutus* can be easily recognizable from any other neriid for its narrow and long antennae, separated by at least twice the length of the scape at base.

Half of the genera of Neriidae present sexual dimorphism, including *Antillonerius* Hennig, 1937 (Sepúlveda and Souza unpublished data), *Indonesicesa* Koçak & Kemal, 2009 (Aczél 1954), *Longina* Wiedemann, 1830 (Buck and Marshall 2004), *Telostylus* Bigot 1859 (Steyskal 1966) and the species *Glyphidops bullatus* (Enderlein, 1922) (Sepúlveda et al. 2014) and *Telostylinus angusticollis* (Enderlein, 1922) (Bonduriansky 2009). In these genera, the males have elongated head and antenna and/or elongate legs with or without conspicuous spines. Males of *L. cornutus* can reach almost twice the size of a small female and the colors are darker in larger representatives. The male fore tibia is swollen (Fig. 10) with thick spine-like setae posteriorly (Fig. 11), conspicuously differentiated from the female thin tibia (Fig. 8). This swollen appearance of the fore leg in males is also present in other genera of Neriidae, including *Indonesicesa*, *Longina* and *Telostylus*. These traits play an important role in male-male competition for oviposition sites, whereas larger and stronger males will have more access to females. This sexual selection drives the evolution of the shape of the body of males (Bonduriansky 2006).

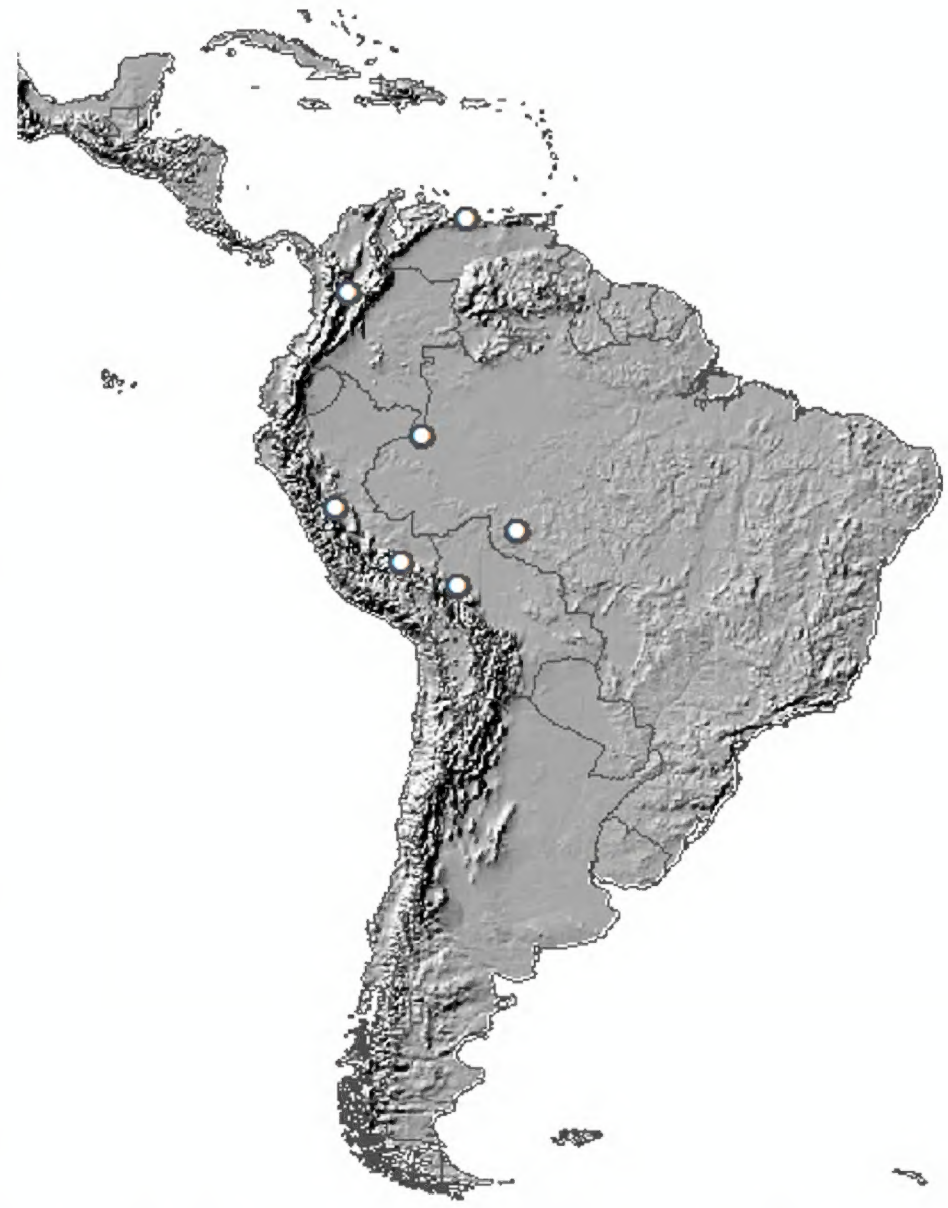


Figure 13. Localities of the species of *L. cornutus* examined.

The genital morphology of *L. cornutus* is not very differentiated from other Neotropical Neriidae, which also present the pattern described for *D. angusticollis* by Bath et al. (2012): "Where the middle section (basal part of distiphallus) joins the distal section (distal part of distiphallus), both species possess a rigid spike"... "and the distal section is a long, unsclerotized, flexible tube, which is coiled up at the base of the epandrium when the genitalia are retracted".

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